RESPONSE TO COMMENTS ON THE DRAFT SOIL VAPOR EXTRACTION PILOT TEST PLAN AND THE DRAFT SOIL VAPOR SURVEY WORK PLAN

903 PAD, MOUND and EAST TRENCHES AREAS

OPERABLE UNIT NO. 2

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

12 January 1993

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ACRONYM LIST

CDH	Colorado Department of Health
DNAPL	dense, non-aqueous phase liquids
DOE	Department of Energy
EPA	U.S. Environmental Protection Agency
FS	feasibility study
GAC	granular activated carbon
HEPA	high efficiency particulate air
IAG	Inter-agency Agreement
IHSS	individual hazardous substance site
IM/IRA	Interim Measure/Interim Remedial Action
mg/ℓ	milligrams per liter
OU	operable unit
ppm	parts per million
ppmv	parts per million volume
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	remedial investigation
SOP	standard operating procedure
SVE	soil vapor extraction
SVS	soil vapor survey
SWCWTF	South Walnut Creek Water Treatment Facility
TCE	trichloroethylene
VOC	volatile organic compound

SECTION 1

RESPONSES TO COMMENTS ON THE DRAFT SOIL VAPOR EXTRACTION PILOT TEST PLAN

1.1 RESPONSES TO EPA COMMENTS

Comment 1

The pilot test plan has been prepared for IHSS 111.1 (Trench T-4). The SVS work plan specifies that IHSS 110 (Trench T-3) will be used to test the SVE unit in the East Trenches Area. IHSS 110 has been designated in the pilot test plan as an alternate test site. Since most of the information contained in this test plan pertains to IHSS 111.1, a substantial revision may be required to include site-specific data for designing a pilot test plan at IHSS 110.

Response to Comment 1

The Pilot Test Plan for the East Trenches Area applies to pilot testing SVE technology at either IHSS No. 110 (Trench T-3) or IHSS No. 111.1 (Trench T-4). The mobile vapor extraction and treatment system, for example, has been designed to accommodate pilot testing at either trench. In fact, this mobile unit was designed for SVE pilot testing at sites located within the 903 Pad, Mound, and East Trenches Areas. Likewise, the extraction/injection well and PM probe layouts for the alluvium and sandstone are the same for pilot testing at Trenches T-3 and T-4. This is because Trench T-3 and T-4 have the same approximate dimensions and are located within the same general geology (Trench T-3 is located immediately to the west of Trench T-4).

Selection of the final location for the East Trenches Area pilot test will be made based on SVS data and any additional Phase II RI data that may become available. SVS data for the East Trenches Area should be available by the end of the first quarter of calendar year 1993 (refer to the SVS project schedule presented in Response to Comment 41). As discussed above, the SVE test procedures and pilot unit performance specifications presented in the Test Plan are applicable for pilot testing at either Trench T-3 or T-4. It is, therefore not critical that the Test Plan be updated if Trench T-3 is selected as the final test location.

Comment 2

There are several inconsistencies between the IM/IRAP, the SVS work plan, and the pilot test plan. For example, the IM/IRAP states that during the SVE test high [efficiency] particulate (HEPA) filters will be followed by a radiation sensor. This sensor would shut the system down before releases of major amounts of radionuclides to the granular activated carbon (GAC) unit could occur. This sensor system, however, is not shown in the SVE pilot test plan (see Appendix A Diagram Number 11). Similarly, the IM/IRAP states, on page 4-33, paragraph 2, that a hydrocarbon concentration of 1 part per million (ppm) will be used for determining a proposed test site. The SVS work plan, however, lists the criterion as a cumulative concentration of all analytes equaling or *exceeding 10 parts per million volume (ppmv). These inconsistencies should either be eliminated or explained.*

<u>Response to Comment 2</u>

The design of the SVE pilot system presented in the Test Plan evolved from the conceptual design presented in the Subsurface IM/IRA Plan. The major differences between the two designs are discussed in Section 1.4 of the Pilot Test Plan.

The sampling system used for radiation sensing is located between Blower B-2 and the exhaust stack (Drawing No. 11). Radionuclides present in the process stream, if any, would be present at levels too low to detect with an in-line sensor because of the dilution with air. The radiation monitoring system has been designed to detect low levels of alpha activity by continuously filtering a portion of the exhaust gas to allow any radionuclides present to accumulate to detectable levels.

The two primary advantages of sampling process exhaust rather than the HEPA filter effluent are the absence of volatile organic compounds (VOCs) and the near-atmospheric pressure of the process stream. These advantages are discussed further in Section 1.4. This design may appear to have the disadvantage of potentially allowing the GAC to become contaminated with radionuclides because the process stream is sampled downstream of the GAC adsorption units. However, if low levels of radionuclides are present in HEPA filter effluent, the GAC will become contaminated as the sample filters are accumulating detectable levels of radioactivity regardless of the sampling location. It is important to note that potential contamination of SVE system GAC is limited to the quantity held by the two adsorption units specified for the pilot unit. In addition to the radiation sampling and monitoring system described in the Test Plan, DOE will also install a prototype selective alpha air monitoring (SAAM) unit after the GAC adsorbers. The SAAMs have been used successfully at RFP for ambient and building air monitoring. A SAAM will have to be retrofitted for monitoring a process line. This effort will thus be developmental in nature.

The Subsurface IM/IRA Plan provided a VOC concentration of 1 ppmV as preliminary guidance for evaluating the potential success of SVE. This concentration was based on the lowest concentration that can be reliably detected with basic field instrumentation (i.e., photoionization detector or organic vapor analyzer). During the development of the Pilot Test Plan, however, it was decided that guidance for evaluating the potential success of SVE should be based on time-weighted VOC mass recovery rather than a discrete concentration measurement. A mass recovery rate of 1 pound per 24 hours of actual operation (i.e., 24-hour operating period) has been proposed in the Test Plan. A recovery rate of 1 pound per 24-hour operating period is an arbitrary value that is based on professional judgment. A calculation presented in Appendix E of the final Test Plan shows that a recovery rate of 1 pound of VOCs per 24-hour operating period corresponds to approximately 10 ppmV of VOCs in the extracted soil vapors at an extraction flow rate of 300 cubic feet per minute.

Comment 3

The IM/IRAP states that the phase II data will be used in the pilot test plans to refine the existing conceptual models of the test areas. This was done for the East Trenches test plan, but the data should be carefully checked for both the 903 Pad and Mound Area pilot test plans.

Response to Comment 3

All available Phase II RI data and SVS data will be examined prior to preparation of the Test Plans for the 903 Pad and Mound Areas.

Comment 4

Page 2-2, Section 2.1.3.1, Paragraph 1. The conceptual model for IHSS 111.1 was based on logs from boreholes number 10291, B217589, and others. The other logs used to define the conceptual model should also be listed in the paragraph.

Response to Comment 4

Borings 10291 and B217589 were primarily used to develop the hydrogeological conceptual model for IHSS No. 111.1. The logs for all other borings in the East Trenches Area were examined to gain a general understanding of the entire area. To avoid confusion, the sentence will be revised as follows: "An idealized conceptual hydrogeologic model based on the logs of boreholes 10291 and B217589 is presented in Figure 2-2."

Comment 5

Page 2-4, Figure 2-2. The new conceptual model of the East Trenches does not illustrate the interbedded interval between 34 and 60 feet. The conceptual model should be modified accordingly.

Rationale: The conceptual model should accurately reflect known subsurface geology features.

Response to Comment 5

The conceptual model of the hydrogeology underlying IHSS 111.1 is intended to illustrate generalized lithologies. The log of boring 10291 shows the interval between 34 and 60 feet as over 70% sandstone with the remaining portion comprised of siltstone and claystone. Given that the occurrences of siltstone and claystone are sporadic, describing this interval as sandstone with a footnote indicating some variability is reasonable. Nevertheless a more detailed footnote will be added to Figure 2-2 describing the depths where the actual lithologies differ from the drawing.

Comment 6

Page 2-5, Section 2.1.4.1. The listed depth-to-water of 35 feet is not confirmed in the log of borehole 10291. If water was encountered during the drilling of this well, it should be indicated on the log.

Rationale: If the borehole log does not confirm the statement in the text, the reference should be removed.

Response to Comment 6

The log for borehole 10291 indicates the presence of water (see the sample descriptions presented in the last column of the log). Beginning at a depth of 35 feet, the log indicates moist, very moist, and wet samples. This information, along with the ground-water level data from monitor well 3687 (i.e., 32 and 35 feet below ground surface), was used to arrive at the depth-to-water for the concept model. Regardless, data from the borings advanced for installation of the pilot test wells will be used to finalize the details of well design and construction.

Comment 7

Page 2-6, Section 2.1.4.2, Paragraph 1. The first statement indicates that a trichloroethene (TCE) concentration of 221.9 milligrams per liter (mg/ℓ) in ground-water samples (which represents 20 percent of the TCE solubility limit) suggests the presence of residual, free-phase TCE in the soils or bedrock underlying IHSS 111.1. This statement requires elaboration as there is no evidence to substantiate this conclusion. In addition, this paragraph attempts to characterize the entire IHSS 111.1 based on ground-water samples collected from monitoring well 3687, which is about 325 feet (ft) northeast of the study area (west end of IHSS 111.1). While useful as a reference, the data are insufficient to characterize the study area.

Rationale: Site-specific data should be used as much as possible to minimize potential problems during implementation of the pilot test.

Response to Comment 7

There is no evidence to substantiate the conclusion that free-phase trichloroethylene (TCE) is present. The statement will, therefore, be revised as follows: "The high TCE concentration of 221.9 mg/ℓ, which represents approximately 20% of the TCE solubility limit, may indicate the presence of residual, free-phase TCE in the soils or bedrock underlying T-4." This hypothesis is based on the dilution that occurs as a contaminant is transported from the source. The relatively high levels of TCE detected (i.e., up to 20% of the solubility limit) may be indicative of a nearby source.

The discussions presented in Subsection 2.1.4 are not intended to advance a conclusive characterization of IHSS No. 111.1. The proposed concept model provides a hypothetical description of the geologic units and contaminant occurrences based on data collected at locations near the site. The model will be updated as site-specific geologic data are collected during the advancement of SVE vent well borings.

Comment 8

> *Page 2-9, Section 2.2, Paragraph 3. The first statement specifies that previous studies indicate that the suspected residual contamination underlying IHSS 111.1 is amenable to treatment by SVE. It is unclear what previous studies are referred to. It should be specified whether these studies were literature surveys or other small-scale studies*
>
> *Rationale: The type of available data can have significant impact on the design of the pilot plan. Further, the nature of contaminants and treatment potential by SVE are critical to the success of the program.*

Response to Comment 8

Any VOC contamination beneath Trench T-4 is expected to be amenable to treatment by SVE technology. This expectation is based on the relatively high Henry's Law constants of the primary volatile organic contaminants of concern (i.e., TCE, PCE, carbon tetrachloride, chloroform, etc.). Previous SVE treatability studies have not been conducted for Trench T-4 (or any other site at OU2). The text will be revised to eliminate the confusion regarding "previous studies."

Comment 9

> *Page 3-1, Section 3.1, Paragraph 1. This paragraph is the first introduction of the western end of IHSS 111.1 as the study area. The selection of one end of the IHSS as the study area and the rationale provided for limiting the study to a small area of the IHSS should be described earlier in the report.*
>
> *Rationale: The study area should be identified earlier in the report and a rationale for selecting the study area should be provided.*

Response to Comment 9

The selection of the western end of IHSS No. 111.1 is preliminary. The actual locations of the SVE vent wells will be selected based on forthcoming SVS and Phase II alluvial RI data. Once the final locations of the wells are determined, the detailed design of the pilot unit will be modified as necessary.

The pilot unit includes one alluvial vapor extraction well and one sandstone bedrock vapor extraction well. These wells are all that are necessary to test the applicability of SVE technology. The results of the pilot test will be evaluated to assess the benefit of adding additional extraction wells at IHSS 111.1 for post-pilot SVE unit operation.

Comment 10

Page 3-3, Section 3.2.2, Paragraph 4. This paragraph discusses the technical difficulties of the design and implementation of the SVE system in the IHSS 111.1 area. These problems include lack of sufficient data on volatile organic compound (VOC) contamination, the possible heterogeneity of the area that may contain a loosely packed backfill soil, and the presence of undisturbed soil. The plan needs to elaborate the reason for selecting this area despite these technical problems.

Rationale: Site selection requires adequate data collection in order to match the technology with the study area and its contaminants.

Response to Comment 10

IHSS No. 111.1 is a candidate pilot test site because the available data indicate that it is a potential VOC source area. The SVS will provide additional information regarding the VOC contamination present. These data will aid in the design and implementation of the SVE unit at the East Trenches Area test site. The heterogeneity of the subsurface will be examined during the SVE pilot tests. The layout of the vent wells and PM probes was specifically developed to provide information on heterogeneity of the alluvium and sandstone bedrock.

Comment 11

Page 4-15, Section 4.8.2, Paragraph 2. This paragraph states that only samples collected during the drilling for vapor extraction vents will be candidates for laboratory analysis. It also states that if no organic vapor readings are measured in any soil samples collected during drilling for vapor extraction vents, the sample collected nearest to the water table in each boring will be forwarded to the laboratory. A rationale should be provided for these statements.

Rationale: The sampling and analytical protocols should be clearly specified in this pilot test plan. Confirmatory samples may be taken to determine the effectiveness of the SVE technology.

Response to Comment 11

The Test Plan will be revised to include VOC analyses of three soil samples collected from vent well borings regardless of field instrument readings. Additionally, VOC analysis of one sample from each of the PM probe borings will be included.

Comment 12

Page 5-4, Section 5.3, Paragraph 1. The daily maximum ground water that will accumulate in the storage tank is given as 7,200 gallons. This value does not take into *account water that will be generated from passing the soil vapor through the knockout drum and demister. This source should be added to the total flow.*

Rationale: *To determine the required total daily storage capacity of the tank, all flow rates should be included.*

Response to Comment 12

The purpose of the knockout drum is to recover any entrained liquid droplets from the process stream. The volume of liquid recovered by the knockout drum is expected to be very small in comparison to the volume recovered by dewatering (i.e., less than 100 gallons per 24-hour operating period).

Comment 13

Page 6-1, Section 6.1, Paragraph 2. *This paragraph states that the mobile vapor extraction pilot unit was not sized specifically for the SVE test at IHSS 111.1. Instead, it states the pilot was sized to accommodate expected conditions at other proposed SVE test sites at the site. It is unclear whether this refers to IHSS 110 or other sites at Rocky Flats. This statement appears to be implying that the SVE test will not be conducted at IHSS 111.1, as specified in the pilot test plan. If this is the case, it should be discussed in the beginning in the pilot test plan.*

Rationale: *The pilot test plan should be specific in discussing the potential test site, or it should state that the final selection is deferred until the SVS is completed.*

Response to Comment 13

To avoid confusion, the statements regarding the design of the SVE pilot unit will be revised as follows: "The mobile vapor extraction unit was designed for pilot testing SVE technology at all of the candidate OU2 test sites (i.e., IHSS Nos. 109, 110, 111.1, 112, and 113)."

Comment 14

Page 6-15, Section 6.8.1, Paragraph 1. *The first sentence regarding the radiation monitoring system refers to Drawing Number 10. This should be corrected to say Drawing Number 11. Drawing Number 10 is the legend for process and instrumentation diagram (P&ID) symbols.*

Rationale: *Drawing numbers should be referred to correctly to avoid confusion.*

Response to Comment 14

This typographic error has been corrected.

Comment 15

Appendix H. Design Calculations. Most of the design calculations are not sufficient. For example, for blower sizing calculations, the test plan shows three configurations. The third configuration, which consists of three blowers and no heat exchanger, was selected without any calculations. Only advantages and disadvantages of each configuration were provided. In addition, calculations for the proposed ground water extraction rate of 5 gallons per minute (gpm) have not been provided. All design calculations should be shown with the related assumptions and references.

Rationale: Design calculations provide the rationale for selecting specific methods, equipment, and system operations, and therefore should be complete.

Response to Comment 15

The design calculations presented in Appendix E are for components of the SVE pilot unit that are common to all three proposed configurations. The pressure drop calculations across the knockout drum and HEPA filters, for example, are common to each of the configurations. The component calculations are then used to compare the advantages and disadvantages of the three proposed process configurations.

Calculations showing the expected drawdown versus groundwater extraction rate will be added to Appendix E. These calculations are based on Phase II RI pump test data obtained at an East Trenches Area site approximately 250 feet to the northeast of Trench T-4.

1.2 RESPONSES TO CDH COMMENTS

Comment 16

Section 3.2.8: The Division needs additional clarification on the limit of 5 gpm identified in the text as the maximum groundwater pumping rate. The reason cited is very brief, but mentions transportation and treatment limitations. The Division does not believe that the existing OU 2 Surface Water Treatment Facility is close to operating at capacity bringing in to question a treatment limitation. In addition, the proximity of T-4 to the treatment facility minimizes transportation concerns.

Response to Comment 16

It may be logistically possible to transport and treat more than 5 gpm. However, the necessity to do so is dependent on the actual drawdown created by the 5 gpm pumping rate and the drawdown necessary to fulfill the intent of the SVE pilot test. Namely, to determine if an incremental increase in VOC mass recovery rate occurs when a portion of the sandstone aquifer is dewatered.

The actual drawdown at a given pumping rate will depend on the aquifer properties at the proposed pilot test location. To date, aquifer tests conducted in the No. 1 Arapahoe Sandstone were performed at a location over 250 feet distant from the proposed pilot test site. Therefore, there is some uncertainty as to the amount of drawdown that can be created at a pumping rate of 5 gpm. Based on the results of the closest aquifer tests, a combined pumping rate from the air extraction and air injection vents of 5 gpm will create over 10 feet of drawdown. Given that the objective of dewatering is to determine if an incremental increase in VOC mass recovery rate occurs when a portion of the aquifer is dewatered. The proposed maximum pumping rate should meet this objective.

In the spirit of the observational approach, the text will be revised to include the following:

- Ground-water pump specifications will require an operating range between 1.0 and 7.0 gpm. This will allow an increase in the pumping rate if site-specific conditions warrant.

- A statement that the actual pumping rate may be increased at the discretion of the EG&G project manager if soil samples collected during the drilling of soil borings suggests the presence of residual DNAPL at depths greater than 10 feet below the water table. The EG&G project manager may also increase the pumping rate if less than 10 feet of drawdown is created at a 5 gpm.

It is likely that logistical considerations will become significant at a pumping rate approaching 10 gpm. The time involved in filling, transporting, and draining the tanker is expected to limit the pumping rate to 10 gpm assuming that no more than one tank truck is used.

Comment 17

> *Section 3.2.8: The "pooling" of DNAPLs at OU 2 sites is of particular concern to the Division. By indicating that the test area would be completely dewatered in the IM/IRA Decision Document, we felt that any DNAPL would be either pumped out with the water or exposed to the vapor extraction process. Now, however, with the admission that the test area probably will not be completely dewatered, pools of DNAPL may not become available to the extraction process. We appreciate the difficulties involved here, but feel that limiting the ground water pumping rate and thereby limiting the groundwater drawdown is not within the original "observational approach" universe of contingencies. This is a factor that is within DOE's control.*

Response to Comment 17

Exposing pools of DNAPL perched in structural lows on impervious geologic materials by pumping ground water would be very difficult regardless of the pumping rate. The cone of depression induced by pumping from a well converges to a point at the elevation of the pump intake. Therefore, if a well is screened through an aquifer and a few feet into underlying impervious material, the radius of the cone of depression at the impervious layer would be very small and, therefore, would not expose DNAPL pools (if any) to an air flow associated with venting.

Exposing DNAPL pools is not an integral component of the IM/IRA. Rather, the objective of the dewatering effort, is to expose residual DNAPL held in the aquifer matrix by capillary forces. It is this material that may be removed by the air flow associated with venting once a portion of the aquifer is dewatered. If by chance one of the venting wells penetrates a pool of DNAPL resting on an impermeable stratum, the DNAPL may flow into the well permitting the recovery of DNAPL contamination as a liquid rather than as a vapor. See response to comment 16 for additional discussion of pumping rates.

Comment 18

> Section 5.3: *Utilization of a truck to transport pumped groundwater to the treatment facility seems very inefficient given the proximity of the test area to the treatment facility.*

Response to Comment 18

Truck transport has been specified for the pilot test and sustained operation phases of the project. These two project phases are expected to be completed within three months after commencement of pilot testing. Information collected during pilot testing and sustained operations will be used to evaluate truck and pipeline transport of ground water during post-pilot operation (if post-pilot operation is conducted).

Comment 19

> Section 4.8.2.: *The sampling of all borings for all types of vents should follow already approved sampling methodologies in the Phase II RFI/RI Workplan(s). In addition, drill cuttings should be drummed pending characterization. Limiting laboratory analysis to only samples from the extraction vents potentially neglects valuable data.*

Response to Comment 19

The emphasis on characterization of contaminant type and distribution for the IM/IRA is considerably less than for the Phase II RI as the IM/IRA objectives are very different from those of a remedial investigation. The sampling program for the IM/IRA was designed to establish baseline organic contaminant concentrations near the proposed vent wells. It is near the vent wells where most of the contaminant removal will take place. However, the Pilot Test Plan will be revised to also include the analyses of soil samples collected during the advancement of soil borings associated with PM probe installation.

Drill cuttings will be drummed pending characterization. Section 4.8.1 of the Pilot Test Plan cites all relevant RFP SOPs.

1.3 RESPONSES TO TECHNICAL REVIEW GROUP COMMENTS

Commenter: **Jerry Morse, Colorado School of Mines**

Comment 20

What is the accuracy of sampling subsurface soil and ground water for VOCs?

Response to Comment 20

With respect to how closely the reported concentrations would be to actual concentrations (accuracy of analytical methods), the commenter is referred to the General Radiochemistry and Routine Analytical Services Protocol (EG&G, 1990).

Comment 21

How are VOCs held in soil? Dissolved in pore-water, entrapped in pore air space, adsorbed (on what?) or held by chemical attachment, or in some combination of the foregoing?

Response to Comment 21

VOCs may be held in soils by all the mechanisms described by the commenter; dissolved in pore water, as vapor in soil pores and adsorbed to organic and possibly clay components of the soil. In addition, liquid (free-phase) hydrocarbons can also be immobilized in pore spaces by capillary forces.

Comment 22

Are there acceptable levels for VOCs in soil and ground water?

Response to Comment 22

The term "acceptable levels" can refer to either ARARs or health risk-based levels. Health risk-based levels are very site specific and have not yet been developed for RFP. There are, however, ARARs for carbon tetrachloride, PCE, and TCE in ground water and drinking water. The Maximum Concentration Limit (MCL) for each of these three compounds is 0.005 mg/ℓ. There are no ARARs for carbon tetrachloride, PCE, and TCE in soils. A thorough discussion of ARARs is provided in Section 3.0 of the Subsurface IM/IRA Plan (EG&G, 1992c).

Comment 23

In heavily VOC-contaminated areas, can their migration rates (from soil to ground water) be estimated from existing data collected under normal meteorological conditions?

Response to Comment 23

The mechanisms involved with the transport of VOCs from soils to ground water might include a gravity driven wetting front of pure hydrocarbon, a gravity driven wetting front of infiltrating precipitation dissolving residual VOCs held in soils, concentration gradient diffusion through soil moisture, and/or VOC vapor migration from contaminated soils to the water table. It is conceivable that these mechanisms could be modeled to predict resulting VOC concentrations in ground water. Such a modeling effort, however, would likely produce results with a high degree of uncertainty. In addition, it is unclear how the calculation of contaminant migration rates from soils to ground water would be relevant to the proposed IM/IRA.

Comment 24

Page 2-6, Paragraph 2.2, bottom. *What minimum airflow is required to disturb existing equilibrium between free-phase, dissolved phase VOCs and soil gas? Were known partition coefficients used to estimate VOC distribution between air and solution phases?*

Response to Comment 24

Assuming that the static condition in the soils near the proposed test site represents equilibrium conditions (i.e., soil gas saturated with hydrocarbons), then any artificially induced air flow will disturb the equilibrium conditions. As fresh air enters the contaminated zone (by drawing atmospheric air vertically through surface soils or by drawing air horizontally from outside the contaminated interval) the VOCs dissolved in soil moisture, adsorbed to soil constituents and free phase VOC's will partition into the "fresh" air in the soil pores. This dynamic process will continue until the flow of air through the soil ceases or the supply of VOCs in the soil is exhausted.

The paragraph cited by the commenter was intended to provide an understanding of the theory behind SVE rather than a site specific description of its application at the East Trenches Area. Therefore, there was no attempt to quantitate on the distribution of VOCs between air and soils.

Comment 25

Page 2-7,8. Table 2.1. *From what depth were samples taken? Were multiple samples taken? Was a sufficient volume of ground water sampled to achieve statistically-valid data?*

Response to Comment 25

Monitoring Well No. 3687 is screened from 20 to 63 feet below ground surface in an unconfined, predominantly sandstone aquifer. It is assumed that samples for VOC analyses were collected near the top of the water column. Because the samples contained TCE in the milligram per liter (mg/ℓ) range (up to 20% of the TCE solubility limit), it is possible that TCE is present as free-phase in the vicinity of this well. Given that TCE is heavier than water, it is possible that higher concentrations existed near the bottom of the well at the time the samples were collected.

The data presented in Table 2-1 was extracted from previous reports and the Rocky Flats Environmental Database System. The data indicate that no duplicate samples were collected from this well for VOC analyses. Concern regarding the volume of water subjected to chemical analyses and its relationship to statistical validity cannot be specifically addressed. It is assumed that the sample collection and analytical methods conformed to RFP SOPs. It should be noted that the relevance of the sample chemistry to the proposed IM/IRA is limited to identifying potential test sites. The presence of mg/ℓ concentrations of TCE in eight consecutive quarterly samples may be indicative of a nearby DNAPL source.

Comment 26

Solution mining of uranium from a shallow subsurface ore body lying in an aquifer may roughly parallel the SVE approach to VOC removal. Uranium recovery, in this circumstance, involves injecting a dilute aqueous bicarbonate solution into the ore body. Dissolved uranium is then pumped to the surface from depths of 30 to a few hundred feet. The pressure drop over the relatively short distances is significant enough to disturb the equilibrium between radon in gas and solution phases. It results in copious quantities of radon release at the surface, threatening the health of operating personnel.

To lessen any occupational hazard, federal agencies require uranium companies to use surface-mounted equipment that disburses radon into the atmosphere, rendering it harmless.

Can an analogy be drawn for anticipated surface releases of VOC from ground water?

Response to Comment 26

Some VOCs will volatilize from the ground water during pumping and transport. However, unlike the high concentrations of radon described in the solution mining example, the concentrations of VOCs in groundwater are low. The risks associated with airborne VOCs resulting from routine SVE pilot unit operations are discussed in Section 4.2.3.7 (Personnel Exposures) of the final Subsurface IM/IRA Plan (EG&G, 1992c). In brief, the risks are negligible with the proper use of PPE.

Comment 27

Page 3-11, Paragraph 3.2.7 Are VOC levels so large that they require GAC adsorption columns, rather than venting directly to air?

Response to Comment 27

The actual VOC mass recovery rate for the proposed SVE pilot system is unknown. Measuring this recovery rate is a critical component of the IM/IRA. Therefore, the Test Plan calls for off gas treatment so that the system is capable of operating under most conceivable conditions. In addition, it is not unusual for remediation projects at RFP to design for non-detectable emissions.

Comment 28

Section 6

- *Does GAC column sizing match adsorption data for expected VOC entrapment?*
- *At expected concentrations, what percent VOC will be trapped on GAC? Percent estimated to escape?*
- *Are columns tested for VOC saturation, or replaced at fixed intervals?*
- *Alpha counting of small samples is accurate only if counted for an extended period. What accuracies do you expect for what counting times?*

Response to Comment 28

The GAC units have been sized to provide ample residence time for adsorption of the VOCs expected in the extracted vapors (i.e., CCl_4, TCE, PCE, chloroform, etc.). Proper operation of the lead and polishing GAC units will result in non-detectable quantities of VOCs in the process effluent. For all practical purposes, all VOCs will be recovered by GAC treatment. Samples from the influent and effluent of GAC-1 and the effluent from GAC-2 will be analyzed for VOCs during the pilot tests and sustained operations (see Section 7 for a complete schedule of measurements). These measurements will track GAC loading and indicate the need for GAC replacement. The data collected during the pilot testing and sustained operations phases may be used to compute the time for GAC replacement during a post-pilot operation phase. Analysis of the appropriate process samples would be conducted to verify the computed estimates, however.

The radiation sampling system described in the Pilot Test Plan has been designed to allow any particulate radionuclides present in the process stream to accumulate to detectable quantities on the sample filters. This is accomplished by continuously filtering a portion of the process stream. The filters are periodically measured for alpha activity. This sampling technique avoids the analytical problems associated with measuring a grab sample that may contain non-detectable quantities of radionuclides. Finally, the Test Plan specifies that the alpha detector will have a 20 percent detection efficiency (i.e., the instrument will be able to detect at least 20 percent of the alpha particles emitted by the sample). A 20 percent detection efficiency is an aggressive requirement for a field monitor.

The DOE will also install a developmental SAAM on the SVE Pilot Unit (see Response to Comment 2).

Comment 29

> *Page 7.1, Section 7.* *Stated criteria for success: 1 lb VOC collected in a 24 hour operating period. Why not give yourself some wiggle room by saying 24 hours of actual operation?*

Response to Comment 29

It was intended that the guidance proposed in the Test Plan for assessing the success of SVE be 1 pound of VOCs collected per 24 hours of actual operation. The Test Plan will be modified as suggested to avoid confusion.

Commenter: **Kathryn Schnoor, Environmental Services Administrator, City of Broomfield.**

Comment 30

> *Since the migration of contaminants from OU2 is not an immediate threat to the public, Broomfield supports the idea of performing a subsurface pilot tests to gather information on treatment options that will aid in the design of the final remedy for OU2. We understand that there are great uncertainties associated with subsurface remediation and agree that the small-scale pilot study test plans are a sensible approach.*
>
> *Broomfield's major concern with the pilot test plan, and the IM/IRA Plan in general, is the proposed use of the South Walnut Creek Treatment System for treatment of the ground water pumped from the subsurface and the condensate from the vapor extraction process. The South Walnut Creek Treatment System hasn't been in place long enough to establish its effectiveness in treating radionuclides. We have not seen any reports or even raw data to date that indicates that the radionuclides treatment is working. Any upset condition with that treatment facility would allow the contaminated ground water to flow directly into Walnut Creek. The City feels the treatment system at the terminal ponds on Walnut Creek is adequate to treat surface water with low level radionuclides as it was intended, but not adequately equipped to treat levels of radionuclides that may come from under OU2. There is potential for contamination to reach Great Western Reservoir or down stream users.*
>
> *The IM/IRA Plan documented that the chemistry of the ground water in that area is uncertain. The pilot test plan does not address deviations from expected conditions due to incorrect assumptions with respect to site-specific hydrogeology and nature of contamination. With the uncertainties about the quality of the ground water and the relatively small volumes of ground water expected to be generated it would be prudent*

to use the Building 231 GAC Adsorption System and the Building 374 Low-Level Wastewater Treatment System. These established systems are well suited for removal of VOC's, radionuclides and metals that may be present in the ground water and condensate. Broomfield strongly urges DOE to pursue this as the preferred treatment option.

The main objective of the pilot test plan is the vapor extraction process, and the plan does a good job of addressing that procedure, but details regarding ground water issues are all but ignored.

Response to Comment 30

A report presenting the results of Phase II of the South Walnut Creek Basin field treatability study that addresses radionuclide removal is expected in July 1993. This information will be available in advance of the SVE pilot test at the East Trenches Area which is currently scheduled for September 1993. In addition, preliminary information regarding the contaminant profile of the ground water at the East Trenches Area test site will be obtained by analyzing ground-water samples collected at the time the sandstone extraction and injection vents are installed. The wells are currently scheduled to be installed in July 1993. The treatability study performance and ground-water analytical data will provide additional insight on the applicability of using the South Walnut Creek Basin facility to treat any ground water generated during the SVE pilot test.

Previous examination of Pu and Am contamination at OU2 indicates substantially higher levels of these radionuclides in surface water than in ground water (EG&G, 1992a). Based on this observation, it is expected that the South Walnut Creek Basin treatment facility will be able to effectively treat any ground water extracted at the East Trenches Area test site.

Lastly, treatment of any ground water recovered during the SVE pilot test at the East Trenches Area may be limited to the following two alternatives: the South Walnut Creek Basin Surface Water Treatment System and the 881 Hillside Ground-Water Treatment System. It appears that the Building 231 GAC Adsorption System will not be available at the time that the SVE pilot test will be conducted at the East Trenches Area.

Comment 31

Page 1-7 Paragraph 3 states that the expected recovery rate for ground water is 5 gpm based on pump test data. This is 5 times more than 1 gpm discussed in the SUBSURFACE IM/IRA PLAN. Could it go higher?

Response to Comment 31

The pumping rate proposed in the Test Plan was based on an aquifer test performed in the vicinity of the proposed test site as part of the Phase II RI. The results of this test became available after publication of the Subsurface IM/IRA Plan but before publication of the draft Pilot Test Plan. The pumping rate described in the IM/IRA Plan was based on less sophisticated aquifer tests in areas that are remote from the proposed East Trenches Area test site. See

Response to Comment 16 for further discussion regarding the 5 gpm ground-water extraction rate.

Comment 32

> *<u>Page 2-10, Section 2.3.1</u> states that the recovered ground water will be tested to determine whether it meets the influent requirements for the South Walnut Creek Water Treatment Facility (SWCWTF). What are the influent requirements? The Pilot Plan references Sec. 4.8 of the Subsurface IM/IRA Plan, but the influent requirements are not specifically listed there either.*

Response to Comment 32

See Response to Comment 33 for a discussion of ground-water sampling and analysis and the capabilities of the South Walnut Creek Basin surface water treatment system.

Comment 33

> *<u>Page 3-13, Paragraph 2</u> states that " SWCWTF was selected as the preferred water treatment facility to process potentially contaminated ground water." Why? It also states that use of alternative facilities will be based on several factors including actual ground water flow rates and contaminant profile obtained during pilot testing as well as the available processing capacity at each facility. What flow rate would make SWCWTF not feasible? What contaminants will be tested for and how often? What concentrations of which contaminants would make SWCWTF not feasible? With production shut down for three years, isn't there excess capacity in Bldg. 374 treatment facility? Again this plan references Section 4.6 of the subsurface IM/IRA Plan for specific criteria and Sec. 4.5 isn't that specific.*

Response to Comment 33

The South Walnut Creek Basin surface water treatment facility was selected as the preferred alternative for the following three primary reasons:

- The South Walnut Creek Basin treatment system has been designed to address all of the contaminants expected in the ground water.
- Proximity to the SVE pilot test sites.
- Minimization of radionuclide-contaminated GAC.

Each of these reasons are discussed in detail in Section 4.3.2.1 of the Subsurface IM/IRA Plan (EG&G, 1992c) (see also the Public Comment Responsiveness Summary, Response to Comment 28 [EG&G, 1992b]). The last paragraph in Section 3 of the SVE Pilot Test Plan will be revised to correctly reference the discussion in Section 4.3.2.1 of the IM/IRA Plan.

The South Walnut Creek Basin surface water treatment system has been designed to process 60 gpm of water. The maximum influent flow to the system recorded for 1991 and 1992 was approximately 25 gpm. Based on the historical influent flow data, it is reasonable to assume that the South Walnut Creek treatment facility currently has 25 to 30 gpm of spare processing capacity.

The ground water collected during SVE pilot testing will be analyzed for the following contaminants:

- EPA Target Compound List VOCs (EPA, 1988).
- EPA Target Analyte List metals (EPA, 1987).
- Gross alpha; gross beta; Sr-89,90; Pu-239,240; Am-241; tritium; and total U-233/234, 235, 238.

The ground water will also be tested for pH, total organic carbon, and turbidity. These data provide information that are important for the operation of the South Walnut Creek Basin treatment system. The ground-water sampling and analysis schedule for the Pilot Test Phase will be included in the final Test Plan.

Practically speaking, there is no limit on the VOC and radionuclide contamination in ground water that can effectively be treated by the South Walnut Creek Basin facility. Free-phase DNAPL could damage the microfiltration units. This potential problem is eliminated by the use of a phase separator, however. Comparison of the ground-water analytical data with the South Walnut Creek Basin field treatability study data (see Response to Comment 30) will verify the ability of the treatment system to effectively process ground water extracted during SVE pilot testing.

Refer to Response to Comment 30 regarding the deletion of the Building 231 GAC Adsorption System/Building 374 Low-Level Waste Treatment System as a viable alternative for treatment of any ground water generated during SVE pilot testing.

Comment 34

Page 5-3, Section 5.3 states that water will be pumped into a 10,000 gallon tank. Is the ground water storage tank double lined? Is there a berm around the tank? Where will the water flow if the tank fails? Is the water in the tank ever tested? For what and how often?

Response to Comment 34

Secondary containment will be provided for the ground-water storage tank. The secondary containment used will be either a double-wall tank with interstitial leak detection or a temporary containment structure. Also, spill containment will be provided to prevent loss of ground water during transfer to and from the tank truck.

Refer to Response to Comment 33 for a discussion of ground-water sampling and analysis.

Comment 35

> *Page 6-17, Section 6.8.2 states that entrained water from the extracted vapor stream will be collected in the knockout drum/demister. The collected water will be pumped from the drum to the ground water holding tank. Is the drum piped directly into the tank? Is the condensate ever tested? For what and how often?*

Response to Comment 35

The knockout drum is piped directly to the ground-water storage tank as illustrated in Drawing No. 11. Water accumulating in the knockout drum will be automatically pumped to the temporary storage tank based on the level in the drum. The water stored in the tank will be sampled and analyzed for VOCs, radionuclides, and metals (see Response to Comment 33). The knockout drum liquid will not be analyzed separately because these data are not necessary for FS analysis of SVE technology. However, the contents of the demister will be inspected for the presence of DNAPL using an electronic interface probe or equivalent. If DNAPL is present, the demister will be retrofitted with a phase separator.

Commenter: Ken Korkia, Rocky Flats Cleanup Commission

Comment 36

> *Radionuclide Monitoring. The Cleanup Commission appreciates the continual monitoring that will be done at the exhaust stack for radionuclide contamination and the implementation of procedures to shut-down the system if high readings and recorded. Still, there should be some type of monitoring system installed before the GAC units to ensure that radionuclide contaminated air will not foul these units.*

Response to Comment 36

See Response to Comment 2.

Comment 37

<u>Radionuclide Contamination of the GAC Units.</u> As mentioned in the previous comment, there is concern that the GAC units could become contaminated with radionuclides during their operation. If there is not going to be a monitoring system installed that will warn of radionuclide contamination of these units, what are the procedures for handling the spent carbon? There appears to be no standardized operating procedure listed in Table D-1 of Appendix D, or in the list of comprising Appendix F, that addresses the testing and handling of potentially radionuclide contaminated spent carbon.

Response to Comment 37

Radionuclide-contaminated soils are not expected at the East Trenches Area pilot test site. Nonetheless, inline HEPA filters (0.3 micron nominal pore size) have been included in the design of the vapor treatment system to remove any radionuclide-contaminated particulates that may be present in the process stream.

Instructions will be developed for the management of spent GAC. The instructions will include procedures for characterizing virgin and spent GAC for radionuclides. Specific handling and disposition procedures will be presented for the following two scenarios:

- The analytical data indicate that radionuclides have not been added to the GAC during SVE unit operation.

- The analytical data indicate that radionuclides have been added to the GAC during SVE unit operation.

The instructions will include procedures for handling, storage, and disposition of spent GAC. The potential for regeneration will be investigated where the analytical data indicate that radionuclides have not been added to the GAC during SVE operation.

Table D-1 of the Test Plan has been modified to note that an SOP for management of spent GAC will be developed.

Comment 38

<u>Use of the South Walnut Creek Treatment System.</u> The Cleanup Commission is concerned over the choice of the South Walnut Creek Seep Treatment Unit as the preferred alternative to treat extracted groundwater. Has this decision been made prematurely given the limited operational history of the South Walnut Creek Unit? Given the Observational/Streamlined Approach framework, more information needs to be given concerning alternatives to the use of the South Walnut Creek system if chemical parameters, especially radionuclides, are different from what is anticipated. There are not many details in this Test Plan for how water will be sampled. Two discrete water

Response to Comment 38

See Response to Comment 33 for the rationale for selection of the South Walnut Creek Basin surface water treatment system as the preferred alternative to process contaminated ground-water generated during SVE pilot test operations.

See Responses to Comments 30 and 35 for discussions regarding the ground-water sampling and analysis strategy.

SECTION 2

RESPONSES TO COMMENTS ON THE DRAFT SOIL VAPOR SURVEY WORK PLAN

2.1 RESPONSES TO EPA COMMENTS

Comment 39

This work plan states that the phase II remedial investigation (RI) data indicate that Individual Hazardous Substance Site (IHSS) 110 (Trench T-3) is better suited for the SVE pilot test in the east trenches than IHSS 111.1 (Trench T-4). However, none of the phase II data are provided to support this conclusion nor is a rationale presented to justify this position. It should also be noted that IHSS 110 does not meet one of the three test site selection criteria. Figure 2-2 of the IM/IRAP clearly shows drums within the boundaries of this IHSS. The reason why this previously unsuitable IHSS has now been chosen should also be explained.

Lastly, it should be noted that the pilot test plan contains a design for the SVE at IHSS 111.1 not IHSS 110. In fact, the pilot test plan does not even mention that IHSS 110 is the preferred location. To resolve this discrepancy, it is recommended that the Department of Energy (DOE) reference all the phase II RI data applicable to the east trenches, analyze them and then present the same choice for the pilot test in both the work plan and pilot test plan documents.

Response to Comment 39

Preliminary Phase II RI data includes contaminant concentrations in soil samples collected during the advancement of soil borings in and around many IHSSs. A review of these data revealed the presence of 13,000 mg/kg of perchloroethylene at 3 feet below ground near the west end of Trench T-3 (IHSS 110). This concentration is several orders of magnitude higher than concentrations for soil samples collected from any other boring during the Phase II RI (based on preliminary data). Therefore, IHSS 110 is now considered the most promising test location. The revised SVS Work Plan will include this information.

It is important to note that the distance between soil borings (advanced as part of the Phase II RI) is on the order of hundreds of feet. This spacing does not provide adequate resolution for the selection of a suitable test site. The size of contaminant source areas may be smaller than the spacing between soil borings. Therefore, it was considered prudent to use the Phase II RI data to identify particular IHSSs as candidate pilot test locations, but to proceed with the SVS at those IHSSs to pinpoint the contaminant source areas. Once the SVS is completed, the final pilot test site will be selected.

There is inconsistency between the SVE Test Plan and the SVS Work Plan with respect to the preferred SVE test location at the East Trenches Area. The decision to identify IHSS 110 as the preferred test location in the SVS Work Plan was based on Phase II RI data that was not available at the time the Draft SVE Test Plan was prepared. It was considered unnecessary to update the Test Plan for the following reasons.

- The contents of the Test Plan is, for the most part, universally applicable to all potential test sites at OU2.

- The actual SVE test location for the East Trenches Area will be based on the results of the SVSs. Therefore, it is possible that the preferred test location will change again based on the results of the SVSs.

The Subsurface IM/IRA Plan states that the presence of buried metallic objects would eliminate an IHSS as a potential test site. Figure 2-2 of the IM/IRA Plan does indicate that buried metallic objects exist in IHSS 110 based on a magnetometer survey. Nevertheless, IHSS 110 is considered a candidate test site for the following reasons.

- The west end of IHSS 110 does not contain metallic objects based on the magnetometer survey, and the west end is where the high concentrations of PCE were detected.

- A boring advanced through the west end of IHSS 110 (10191) did not encounter any metallic objects (based on the boring log).

- The SVE Test Plan calls for the installation of subsurface components of the SVE system outside of the IHSS.

Comment 40

The IM/IRAP indicates that the phase II RI data will be used to pinpoint locations for the SVE. If there is not enough information, an SVS will be conducted to gather the additional data. However, the SVS work plan describes conducting these surveys at all three proposed SVE sites within OU2 and no reference is made to the phase II RI data. Therefore, it appears that the phase II data are not being used. DOE should explain why it is conducting an SVS at all three OU2 locations rather than relying on the phase II data and possibly an SVS to delineate appropriate locations for the SVE.

Response to Comment 40

See Response to Comment 39.

Comment 41

No schedules for implementation of or data evaluation of the SVS program are provided. However, page 2-1 of the pilot test plan states that the SVS will be conducted during the first half of 1993. If the schedule for implementation is known it should be provided in the work plan. In addition, the schedule for the SVS should be compared with the schedule for the SVE pilot test plan. This is important because the exact locations for the pilot test activities are partially dependent on the results of the SVS. Specifically, it is not clear how the final pilot test plan and bids for subcontractors can be ready as planned on January 12, 1993, when the SVS may not have been conducted by then. Lastly, the lack of a schedule severely limits EPA's ability to oversee the field activities. These apparent scheduling problems must be addressed in both the work plan and pilot test plan.

Response to Comment 41

The following proposed schedule for planning and implementation of the SVS at OU2 has been included in Section 1 of the final SVS Work Plan.

Activity	Date
Submit Draft SVS Work Plan to EPA/CDH	29 October 1992
EPA/CDH Comments on Draft SVS Work Plan	26 November 1992
Submit Final SVS Work Plan to EPA/CDH	12 January 1993
Begin SVS	19 February 1993
Submit Final SVS Report to EPA/CDH	22 weeks after SVS is completed

The schedule presents specific completion dates for project activities leading up to the commencement of the SVS at Site 1 (i.e., East Trenches Area). Due to the uncertainty associated with the actual length of time that will be required to complete the SVS, estimated time durations are listed in lieu of specific completion dates for activities conducted subsequent to "Begin Site 1 SVS." The proposed schedule indicates that SVS data for the East Trenches Area will be available on or before 09 April 1993. These data will thus be available prior to completion of the detailed design for the SVE pilot unit which is scheduled for 26 April 1993 (see final SVS Pilot Test Plan, Table 9-1).

It is important to emphasize that the SVS data are only required for specification of the SVE vent well locations. These data are not necessary for design of the mobile vapor extraction and treatment system. Also, final design of the vent wells will be completed in the field based on the logs of the borings advanced to install the wells.

Comment 42

There is no discussion of problems associated with collecting SVS samples during cold weather. This is a concern because cold weather can impede the vapor flow. If the SVS will be conducted during the winter months, this issue must be addressed.

Response to Comment 42

The SVS may be conducted during the winter months. Although a frost layer will make it more difficult to drive sampling probes, it should not impede the flow of soil gas to the sampling probe (to be driven below frost depth). In fact, the frost layer may prevent the escape of organic vapors to the atmosphere during the winter months increasing the concentrations in the subsurface. This effect may be offset by the lower equilibrium vapor pressure at colder vs. warmer subsurface temperatures.

Comment 43

Page 1, Section 2.1. This paragraph references 5,000 gallons of fluid released at the former drum storage area. It is not clear how this volume estimate was determined as the June 1992 historical release report does not list a specific volume of fluid spilled in this area. The appropriate reference should be added to this paragraph.

Rationale: Data listed in this section must be properly substantiated.

Response to Comment 43

The correct reference is Rockwell, 1987; Phase I Remedial Investigation Report. This reference will be added to the revised SVS Work Plan.

Comment 44

Page 3-15, Section 3.5.2. Reference is made in this section to a slam bar that will be used to drive a preliminary hole in the soil in areas where hole refusal is possible. The slam bar is described as having a diameter less than the soil probe. Further details of how this slam bar will be handled in the field must be provided. In addition, the diameters of the soil probe and slam bar should be listed. This is important, since a very thin slam bar may be inappropriate for the cobbly surface soils at Rocky Flats.

Rationale: As currently written, this section of the work plan does not provide sufficient detail to direct the field program.

Response to Comment 44

This document is a performance specification. The equipment and methodologies presented in Sections 3.4, 3.5.1, 3.5.2 and 3.5.3 are intended as guidance rather than requirements. The contractor performing the SVS will be required to collect samples from the locations and depth specified in the Work Plan and to meet the QC requirements. The offerer will provide in their cost and technical proposal, their preferred methods for meeting the requirement of the Work Plan.

Soil gas survey contractors may use different methods for collecting and analyzing samples. Therefore, if a particular methodology is required by this Work Plan, it may severely limit the number of contractors that could bid competitively for the work. The Work Plan was written as a performance specification to allow competitive bidding between many contractors.

Comment 45

> *Page 2-2, Section 2.2. The log of boring 7391 is not provided for review. The information from the phase II boring should either be provided in the SVS work plan or the pilot test plan for the 903 Pad Area.*
>
> *Rationale: Subsurface geology data not previously presented which provide the base for study design should be provided for review.*

Response to Comment 45

The log of boring 7391 will be provided in the SVE Pilot Test Plan for the 903 Pad Area.

Comment 46

> *Page 3-2, Figure 3-1. This figure currently lists the 903 Pad in the boxes located under the title block Phase III Work for the East Trenches Area. This typographic error should be corrected.*
>
> *Rationale: All work for the East Trenches Area should be correctly labeled East Trenches Area.*

Response to Comment 46

The revised SVS Work Plan will be corrected.

Comment 47

> *Page 3-3, Section 3.3. This section and the accompanying figures state that the SVS samples will be collected at 30-foot intervals. However, Appendix A states that the sampling points are based on a 15-foot grid spacing. This inconsistency should be corrected.*

Rationale: *For clarity among field workers, the text and appendices should specify the same sampling grid.*

Response to Comment 47

The revised SVS Work Plan will be corrected.

Comment 48

Figures 3-3, 3-5, and 3-6. These three figures illustrate the sampling locations for IHSS 109, IHSS 110, and IHSS 111.1. IHSS 111.1 and 109 are the designated alternate test sites for the East Trenches Area nd 903 Pad respectively. All three of these IHSSs are rectangular in shape and are approximately 3-feet wide. Even though these IHSSs are very narrow, SVS samples will be collected on both sides of the trenches. Because a SVS sampling grid is normally between 25- and 50-feet wide, it is not clear why SVS sampling points are needed across a distance of only 3 feet. Justification for this spacing should be provided prior to initiating this field program.

Rationale: *SVS sample locations on one side of the IHSS rectangle should be able to detect any accumulation of soil vapor in a 3-foot area.*

Response to Comment 48

The figures illustrating soil vapor sample locations will be revised to show sample locations approximately 2 feet from the boundary of the IHSS. This coupled with the fact that sample locations on either side of the trenches are offset from each other gives an actual sample spacing across the trenches of approximately 16.5 feet. This sample spacing should provide adequate data for selecting the locations of the SVE vent wells. Sample spacings of 25 to 50 feet are typical for mapping contaminated ground-water plumes. Closer sample spacing are necessary to locate SVE sites, however.

2.2 RESPONSES TO CDH COMMENTS

Comment 49

There remains some confusion regarding IHSSs 110 and 111.1. The SVE Pilot Test Plan is built around the original assumption that IHSS 110 would be the best location. However, as the original IM/IRA was structured, DOE had the flexibility to change the plan if subsequent information indicated a better SVE location. If, as is indicated in Section 1.1 of the SVS Workplan, IHSS 111.1 now appears to be preferable, why does the final paragraph of Section 1.1 state that the SVS will first investigate IHSS 110 which, if it is adequate, will necessitate modification of the Pilot Test Plan? This seems backward to us. If IHSS 111.1 is preferable, then starting the SVS survey there seems more logical.

Response to Comment 49

See Response to Comment 1.

Comment 50

While we realize that the proposed SVS program is not designed as a characterization effort, the Division would like for DOE to make the surveys as consistent as possible with other soil gas surveys that will be implemented under other IAG activities. Therefore, we urge that:

- *the soil vapor probe intake be placed at least 5 feet below the ground surface.*
- *the SVS subcontractor operate under all preexisting and applicable SOPs.*

Response to Comment 50

The sample depths of 3 to 5 feet were specified to give an acceptable range for sample collection. The cobbly nature of Rocky Flats Alluvium may make it difficult to drive sampling probes to a particular depth. It was felt that 5 feet should be the target depth, however, if a sampling probe could not be driven beyond 3 feet, it was considered desirable to collect the sample at 3 feet rather than abandon the sample location based on sample probe refusal. If the sampling probe can not be driven to 3 feet, the sample location would be abandoned based on sample probe refusal.

The SVS subcontractor will operate under all applicable RFP SOPs. All applicable RFP SOPs will be implemented.

Comment 51

On Figures 3-3, 3-5, and 3-6, survey points are indicated for IHSSs 109, 110, and 111.1. Since these IHSSs are very narrow (approximately 3 feet), please explain why survey points along each side of the trenches will be necessary. The Division recommends that at least three 25 to 50 foot-spaced lines of survey points be run for each of these IHSSs with the middle line of survey points being directly adjacent to one of the IHSS edges.

Response to Comment 51

See Response to Comment 48 for a discussion of sample spacing. (It is important to emphasize that the purpose of the SVS is to identify sources for ground-water contamination [areas of heavily contaminated soils] and not to map a dissolved contaminant ground-water plume.)

Comment 52

A schedule needs to be developed for implementation of the SVS.

Response to Comment 52

See Response to Comment 41.

SECTION 3

REFERENCES

EG&G, 1990. General Radiochemistry and Routine Analytical Services Protocol.

EG&G, 1991. Surface Water Interim Measures/Interim Remedial Action Plan/Environmental Assessment and Decision Document, South Walnut Creek Basin, Operable Unit No. 2, U.S. Department of Energy, 8 March 1991.

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EG&G, 1992c. Subsurface Interim Measures/Interim Remedial Action Plan/Environmental Assessment and Decision Document, Operable Unit No. 2, U.S. Department of Energy, 10 September 1992.

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